

Measurement based timing and WCET analysis with RapiTime

RapiTime

How can RapiTime help you?

RapiTime is an advanced tool for performing timing and worst-case execution time (WCET) analysis, designed specifically to work with embedded targets and to satisfy certification requirements. The timing metrics produced by RapiTime can be used to demonstrate you have satisfied DO-178B/C objectives.

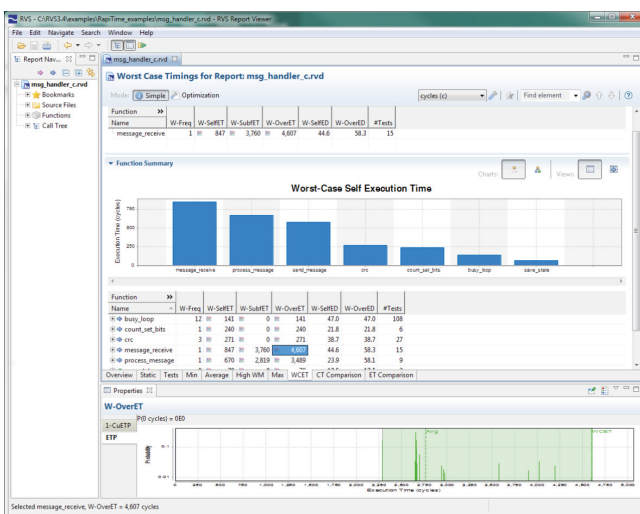
RapiTime combines static and dynamic analysis of your code on target to provide you with detailed information on its timing behavior.

You can use RapiTime to automate timing data collection and analysis even on very large systems. In one case study, RapiTime produced in just one day the data that it took the customer 8 months to collect manually.

RapiTime's minimal overhead means you can perform timing analysis in every test run, making timing information available throughout your development process. This information will help you identify timing issues early in development and minimize WCET.

RapiTime use cases

- Demonstrate that software executes within its time constraints.
- Understand timing behaviour when upgrading to new targets, even multi-core processors.
- Optimize code to upgrade legacy systems.
- Conduct WCET/high water mark analysis.
- Address DO-178B/C guidelines.



How does RapiTime work?

RapiTime performs static analysis of code and instruments it automatically. When you run your code on-target, RapiTime collects a trace of program execution that includes timing data. RapiTime then processes this trace to produce qualifiable reports of the timing behavior of your code that you can view using the RapiTime GUI.

RapiTime lets you automate timing analysis on your embedded system so you can identify timing issues and optimize your code early in the development process, saving you future expense.

The timing reports RapiTime produces, along with its trace rewind feature, let you quickly identify where your optimization effort will provide the greatest improvements to timing behavior.

Benefits of using RapiTime

RapiTime helps you reduce the cost, time and effort you need to perform timing analysis and optimization on even the most complex and demanding safety-critical real-time embedded systems.

RapiTime's instrumentation process can be customized to suit your timing analysis needs. Whether you need to perform timing analysis with limited target memory, support for large and complex code bases, or to automate timing analysis throughout your development pipeline, RapiTime is the tool you need.

Key features of RapiTime

Timing analysis

- On-target and on-host timing analysis
- Powerful hybrid WCET analysis engine
- High water mark (HWM) analysis
- Analysis configurable to include or exclude specified modules/functions/directories
- Time band analysis
- Full automation
- Calculation of the following metrics for each function and sub-function:
 - Minimum, maximum and average execution time
 - Execution time density
 - Contribution to worst-case and HWM paths

Analysis engine

- Context-sensitive analysis
- Support for function pointers and recursion
- Powerful annotation mechanism
- Complex code structures

Language support

- Ada 83, 95, 2005 and 2012, support for compilers including GNAT Pro and Green Hills
- C and C++, support for compilers including VisualStudio, GCC, Diab and TASKING
- Assembly code insertions
- Mixed language source code

Build integration

- Multiple strategies available:
 - Compiler wrappers
 - Clone integration
 - Scripting into build system directly
- Support for very large code bases
- Support for legacy compilers
- Instrumentation can be split between build cycles
- Shared integration with other RVS tools

Target integration

- Flexible trace collection using CAN, Serial, Ethernet, debuggers, in-memory trace buffers, hardware I/O tracing, hardware tracing support e.g. Nexus, and our own **RTBx** data logger

- Extremely low overhead instrumentation library
- No library/run-time dependencies or dynamic memory requirements
- Support for zero overhead instrumentation on selected targets
- Timing analysis across power cycles (subject to hardware requirements)
- Data collection freeze and reset to eliminate accidental tracing
- Extremely fast, lock-free, thread-safe tracing mechanism
- Optimal instrumentation of 8, 16, 32 and 64 bit architectures
- Support for multitasking and multi-core processors

Tool qualification

- High-quality kit to support DO-178B/C tool qualification
- Qualified text exporter

Third party integration

- Tools such as Mx-Suite™, MATLAB Simulink and GNAT GPS
- Continuous build servers e.g. Jenkins, Bamboo
- Debuggers e.g. Lauterbach, i-SYSTEM

GUI

- Summary and detailed views
- Code viewer:
 - View source code alongside pre-processed and instrumented code
 - Color-coded by WCET and high water mark paths
- Show other code metrics e.g. #LOC, #loops
- Trace rewind feature
- Aggregate timing metrics by directory, file and functions
- Multiple export formats: text, XML, CSV, image formats
- Merge results from different test runs, builds and strategies
- Compare reports
- Database-like search function

Licensing

- Enterprise License gives you access to new versions, support and maintenance
- One-year support and maintenance included in purchase price
- Single price for all features
- Licenses transferrable across projects



Rapita Systems Inc.
41131 Vincenti Ct.
Novi, MI 48375

Tel (USA):
+1 248-957-9801

Rapita Systems Ltd.
Atlas House, Osbaldwick Link Road
York, YO10 3JB
Registered in England & Wales: 5011090

Tel (UK/International):
+44 (0)1904 413945